CHAPTER 12

PRICE AND OUTPUT DETERMINATION UNDER OLIGOPOLY

Chapter in a Nutshell

We reserved the discussion of price and output determination under oligopoly for a separate chapter because it’s more complicated than the other market structures. First, this chapter considers the problem of describing the degree of oligopoly in a market. Oligopoly can occur in different forms — e.g., balanced and unbalanced oligopoly. The degree of market power, that is, the ability to control price and output, can be estimated with either a concentration ratio, which is the percentage of sales of the leading firms, or the Herfindahl-Hirschman index, which is the sum of the squares of all the firms’ market shares. The concentrated market power that may exist in oligopoly markets can be increased by mergers. Mergers can be horizontal, vertical, or conglomerate. Cartels arrived at through collusion can give rise to greater concentrations of market power without mergers. Because oligopoly is such a varied market structure, it should come as no surprise that a variety of theories exist to explain price and output determination in oligopoly. These include game theory pricing, the godfather or price leadership theory, the kinked demand curve, brand multiplication, price discrimination, and cartel pricing.

After studying this chapter, you should be able to:

- Use concentration ratios and the Herfindahl-Hirschman index to characterize different forms of oligopoly.
- Describe trends in concentration ratios.
- Distinguish between balanced and unbalanced oligopoly.
- Compare the extent of oligopoly markets in the United States and in other industrialized countries.
- Discuss the types of mergers and the impact of different types of mergers on industry concentration.
- Give examples of cartels and collusion.
- Present theories of price and output in oligopoly including game theory, price leadership, the kinked demand curve, brand multiplication, price discrimination, and cartel pricing.

Concept Check — See how you do on these multiple-choice questions.

This question focuses on the differences between balanced and unbalanced oligopoly.

1. In an unbalanced oligopoly, market power is
   a. controlled by collusion
   b. distributed evenly among firms in the industry
   c. distributed unevenly among firms in the industry
   d. constantly changing over time
   e. constantly changing according to the industry
What happens to concentration ratios if we include the items in responses a, b, and c in their calculation?

2. **Concentration ratios** tend to be overstated because
   a. they exclude industries producing goods that have high cross elasticities
   b. they exclude imports
   c. they exclude second-hand markets
   d. b and c are correct
   e. a, b, and c are correct

In answering this question, remember that game theory models emphasize how the outcomes for different players depend not only on their strategies, but the strategies of the other players as well.

3. **Game theory** is a useful tool for describing oligopoly price and output decisions among firms that are
   a. interdependent
   b. independent
   c. regulated
   d. international
   e. merging

Does a price leader take into account the price and output decisions of other firms in the market? Why or why not? Think about this characteristic of a price leader as you ponder this question.

4. The **price leadership** model best explains
   a. cartel pricing
   b. pricing with brand multiplication
   c. pricing in horizontal mergers
   d. pricing in vertical mergers
   e. pricing in unbalanced oligopoly

In the kinked demand curve model, what happens to the firm’s total revenue if it either raises or lowers the price? Does it make sense for the firm to raise or lower price?

5. In the **kinked demand curve** model, the price tends
   a. to fall as firms cheat on cartel agreements
   b. to be stable
   c. to be sensitive to changes in marginal cost
   d. to rise as a result of cartel formation
   e. to be quite volatile

**Am I on the Right Track?**

Your answers to the questions above should be **c, e, a, e, and b**. By now, you should have acquired the tools of analysis necessary to construct a variety of models to describe the most prevalent and probably the most interesting of the market structures, oligopoly. So we’ll run through the key words, then get on with questions about oligopoly so that you can master the complexity of this market structure.
**Key Terms Quiz** — Match the terms on the left with the definitions in the column on the right.

1. concentration ratio  ____ a. a merger between firms that have a supplier-purchaser relationship
2. market power  ____ b. oligopoly where the sales of leading firms are distributed unevenly
3. unbalanced oligopoly  ____ c. a merger between firms in unrelated industries
4. balanced oligopoly  ____ d. a pricing strategy in game theory in which a firm chooses a price and will change its price to match whatever price the competing firm chooses
5. kinked demand curve  ____ e. an arrangement where two or more firms undertake a specific economic activity together
6. price discrimination  ____ f. ratio of total sales of the leading firms in an industry to total industry sales
7. price leadership  ____ g. a table that matches the sets of gain (or losses) for competing firms when they choose various pricing options
8. horizontal merger  ____ h. a theory of strategy in oligopoly where the firms’ behavior is mutually interdependent
9. vertical merger  ____ i. a firm’s ability to select and control market price and output
10. conglomerate merger  ____ j. sum of the squares of the market shares of all the firms in the industry
11. cartel  ____ k. a set of pricing strategies adopted by firms in which none can improve its payoff outcome, given the price strategies of other firms
12. collusion  ____ l. oligopoly where the sales of the leading firms are distributed evenly
13. game theory  ____ m. sale of the same good or service at different prices to different people
14. Herfindahl-Hirschman index  ____ n. elastic demand for price increases, inelastic demand for price decreases
15. brand multiplication  ____ o. price decisions of a firm are accepted and followed by other firms in the industry
16. joint venture  ____ p. the practice of firms to negotiate price and market-share decisions
17. payoff matrix  ____ q. a merger between firms producing the same good in the same industry
18. Nash equilibrium  ____ r. variations on one good produced in order to increase market share
19. tit-for-tat  ____ s. a group of firms that collude to limit competition

**Graphing Tutorial**

The kinked demand curve model can be somewhat intimidating on first sight. However, if you keep in mind what the model is intended to explain, it makes good sense. The model explains why price rigidity in oligopoly is commonly observed. Consider General Motors’ decision to raise or lower the price on its new model cars. GM may interpret its situation as follows. If GM raises the prices of its new cars, GM’s competitors will not follow GM’s lead and will leave their prices unchanged. Thus, GM will lose many sales along a relatively elastic demand curve. However, if GM lowers the prices of its new cars, other firms will follow GM’s lead, and only a small number of new sales will be made along a steep inelastic demand curve because GM’s competitors are cutting prices at the same time. In effect, GM faces two demand curves — one that is relatively elastic for prices above the current (or start) price and one that is relatively inelastic for prices below the current price. The demand curve has a kink at the current price.
If there are two distinct demand curves for GM, then there must also be two distinct marginal revenue curves, one for each of the demand curves. Thus, there is a relatively flat marginal revenue curve that corresponds to the elastic demand curve above the current price. And, there is a relatively steep marginal revenue curve that corresponds to the inelastic demand curve below the current price. A graph representing GM’s kinked demand curve, the two marginal revenue curves, and the marginal cost curve is shown below.

The elastic portion of the demand curve is the segment labeled AB, above a price equal to $20,000 per car, and the inelastic portion of the demand curve is the segment BC below the $20,000 price. Corresponding to demand segment AB is marginal revenue segment AD, and corresponding to demand segment BC is marginal revenue segment A’D’.

The marginal cost curve has been drawn so that it passes through a gap between the two segments of the marginal revenue curve. The gap between the marginal revenue curves, occurring above the output level of 500,000 cars, is significant because GM is able to equate MR and MC to maximize profits anywhere within this gap. GM has no incentive to raise or lower price — profits are maximized at the price $20,000 and an output level of 500,000 cars. Moreover, the marginal cost curve could shift within the gap between the marginal revenue segments, and GM would still not change either price or output. Thus, the kinked demand curve model demonstrates price rigidity in oligopoly.

**Graphing Pitfalls**

The kinked demand curve model is just that — a graph that shows a kink in the demand curve. However, the kink in the demand curve causes there to be a gap between the segments of the marginal revenue curve that correspond to the elastic and inelastic segments of the demand curve. The marginal revenue curve isn’t kinked. So don’t try to represent this model with both a kinked demand curve and a kinked marginal revenue curve, as shown on the following page!
Only the demand curve has a kink, not the marginal revenue curve — there should only be a gap between the segments of the marginal revenue curve.

**True-False Questions** — If a statement is false, explain why.

1. Firm behavior under oligopoly is more varied than under perfect competition. (T/F)

2. Oligopoly has fewer firms and is more concentrated than monopolistic competition. (T/F)

3. In order for two firms to begin a joint venture, they must form a cartel. (T/F)

4. The concentration ratio describes the percentage of industry sales controlled by a specific number of firms. (T/F)

5. Brand multiplication is a means used by an oligopolist to increase market share. (T/F)

6. The Herfindahl-Hirschman index measures the industry sales of the four leading firms in an industry. (T/F)

7. In unbalanced oligopoly, one firm controls a much higher percentage of sales than the others. (T/F)

8. Concentration ratios are understated because imports are not included in their calculation. (T/F)

9. The oligopoly character of U.S. industry is unique in world markets. (T/F)
10. The kinked demand curve explains why prices in oligopoly are relatively stable. (T/F)

11. A horizontal merger occurs when two firms in the same industry combine. (T/F)

12. Because smaller firms are typically ignored in oligopoly, they can easily charge a different price than the price set by the godfather or price leader. (T/F)

13. Vertical mergers are the most common merger form observed in the United States. (T/F)

14. In a Nash equilibrium, no other pricing strategy exists that would improve the players payoffs. (T/F)

15. The game theory view of oligopoly argues that prices are subject to fits of change as firms test each other’s responses. (T/F)

**Multiple-Choice Questions**

1. The extent of oligopoly power in the United States can be measured by the
   a. low concentration ratios observed
   b. large number of firms in all industries
   c. number of very large firms in all industries
   d. high concentration ratios observed
   e. percentage of national sales accounted for by the four largest firms in various industries

2. The more inelastic segment of the kinked demand curve model describes a situation where rivals __________ price changes, while the more elastic segment describes a situation where rivals __________ price changes.
   a. follow; don’t follow
   b. earn higher profits with; earn lower profits with
   c. don’t follow; follow
   d. advertise; don’t advertise
   e. consider; don’t consider

3. Karl Marx made the incorrect prediction that
   a. oligopoly power would increase in capitalist countries
   b. concentration ratios would fall
   c. all oligopolies would become balanced
   d. all oligopolies would become unbalanced
   e. all monopolies would eventually become oligopolies because barriers to entry would be overcome

4. Given industries A and B with identical concentration ratios equal to .75, if industry A is unbalanced and industry B is balanced, then the Herfindal-Hirschman index will be __________ for __________.
   a. smaller; industry A
   b. the same; industry A and industry B
   c. larger; industry A
   d. larger; industry B
   e. rising; industry B
5. A cartel agreement is likely to be unstable if
   a. the profit-maximizing level of output for the cartel is not reached
   b. the cartel member’s quota is less than the profit-maximizing output for that member
   c. only a few firms/countries belong to the cartel
   d. the behavior of members of the cartel is easy to monitor
   e. there is no godfather to enforce the agreement

6. Concentration ratios for industries in other industrialized countries are
   a. much higher than in the United States
   b. much lower than in the United States
   c. rising rapidly compared to the United States
   d. similar to those in the United States
   e. falling more rapidly than those in the United States

7. The most commonly observed type of merger is a
   a. vertical merger
   b. horizontal merger
   c. conglomerate merger
   d. hostile merger
   e. concentrated merger

8. If a horizontal merger occurs in the shoe industry, then the concentration ratio in that industry is likely to
   a. increase
   b. decrease
   c. stay about the same
   d. resemble those in similar industries
   e. follow a historical trend

9. A vertical merger with a dominant oligopolist in an industry allows the merged firms to
   a. become a monopoly
   b. control most levels of production in an industry
   c. survive indefinitely
   d. block entry by foreign competitors
   e. lower price while, at the same time, raising profit

10. Suppose that a cartel guarantees all members a significant profit if they abide by the cartel’s decisions regarding price and output. However, profits for an individual member of the cartel rise dramatically if they reduce the price while other members keep their price at the agreed-upon level. However, the other members suffer heavy losses by keeping their price the same. If all the firms cut their price below the cartel level, each one makes a small profit. In this case, the Nash equilibrium strategy is for each firm to
    a. stay with the agreed-upon cartel price
    b. raise price above the cartel level
    c. shut down
    d. lower their prices
    e. decrease output

11. Given an unbalanced oligopoly where one firm’s price decisions are followed by other firms, there is
    a. a cartel
    b. price leadership
    c. a reduction in differentiated products
    d. mutual interdependence among the firms
    e. an increase in price and profit
12. If we consider the game theory explanation of pricing for two firms, then all of the following are likely scenarios except that
   a. the two firms will equate their own marginal revenue and marginal cost curves independently
   b. the two firms might maximize joint profits by both setting a high price
   c. the two firms could suffer from competitive price cutting
   d. the two firms’ pricing decisions are interdependent
   e. one firm can undercut the other by setting a lower price

13. The godfather theory of oligopoly pricing argues that the
   a. smaller firms dictate the price to the godfather because the smaller firms typically collude
   b. smaller firms’ price is higher than the godfather’s because smaller firms cannot capture economies of scale
   c. godfather and smaller firms price independently, but the godfather ends up with the largest share of the market
   d. godfather sets price and output where its marginal revenue equals its marginal cost and the smaller firms accept that price
   e. demand curve is downward sloping for the godfather and horizontal for the others

14. The “gray area” of price discrimination refers to the idea that
   a. a firm is never certain that it has segmented the market correctly
   b. customers who purchase the good at a lower price resell at a higher price, causing profits to decrease
   c. to practice price discrimination, a firm must offer identical products or services at different prices
   d. oligopolists are uncertain as to the maximum price to charge segments of the market
   e. it is uncertain that price discrimination leads to higher profits

15. In the kinked demand curve model of oligopoly, if one firm cuts its price, then
   a. other firms will follow with price cuts of their own
   b. other firms will follow with price increases to increase short-run profit
   c. the demand curve facing the firm becomes very elastic, increasing profit
   d. its profit increases dramatically in the long run
   e. other firms won't respond at all because they are already maximizing profit

16. The existence of a marginal revenue gap in the kinked demand curve model of oligopoly is derived from
   a. price rigidity
   b. the gap in the demand curve
   c. the kink in the demand curve
   d. a shifting marginal cost curve
   e. uncertainty about the position of the demand curve

17. Brand multiplication in oligopoly occurs due to the desire of firms to
   a. satisfy consumers' changing tastes
   b. respond to changing cost structures
   c. increase market share without lowering prices
   d. lower price and increase output and profit
   e. keep demand highly elastic to maintain maximum profit

18. Price discrimination applies to cases where an oligopolist can
   a. segment the market and charge different prices to different consumers for the same good or service
   b. raise the price of a good or service unfairly to consumers it considers undesirable
   c. can charge different prices to different consumers for similar goods and services
   d. restrict output and raise price
   e. prohibit sales to certain groups of consumers
19. In the kinked demand curve model, the more elastic portion of the demand curve corresponds to a situation where rivals _____________ in their pricing behavior while the more inelastic portion of the demand curve corresponds to a situation where rivals ________________ in their pricing behavior.
   a. do follow; don’t follow
   b. don’t follow; do follow
   c. raise price; lower price
   d. lower price; raise price
   e. raise price; keep price the same

20. A strong argument that can be made to show the inherent instability of cartels is
   a. cartel members are prone to be unprofitable in the long run
   b. cartels seldom set the price at the profit-maximizing level
   c. some cartel members may be able to increase their profits by exceeding their quotas
   d. quotas are established that inevitably create a surplus situation
   e. governments make every effort to break them up

The following questions are related to the applied, theoretical, historical and global perspectives in the text.

21. The merger between Coors and Molson was considered by some Canadian observers to represent
   a. an opportunity for higher profits
   b. a chance for both companies to enter new markets
   c. a means to achieve greater economies of scale
   d. the result of protracted negotiation regarding new product development
   e. the loss of yet another symbol of Canadian identity

22. Although the prisoners’ dilemma game theory model does not perfectly replicate the circumstances faced by firms in an oligopoly, since they can communicate with one another to a degree, it does emphasize that
   a. firms in oligopoly act completely independent of one another
   b. honesty is always the best policy
   c. cheaters on pricing agreements among firms in an oligopoly are typically caught and punished
   d. firms in an oligopoly market should not be allowed to communicate with one another
   e. firms in oligopoly engage in mutually interdependent decision making

23. Although the idea has been proposed that five southeast Asian countries form a rice cartel, the creation of a successful cartel for rice will be very difficult because
   a. the five countries are on poor diplomatic terms
   b. there is no agreement on quotas for each country
   c. there are too many rice producers to form a cartel
   d. there is no agreement on what price to charge
   e. Thailand continues to refuse to join the cartel

24. Which of the following statements about OPEC is false?
   a. OPEC controls roughly 40 percent of world oil production.
   b. Saudi Arabia is the biggest oil producer among OPEC members.
   c. OPEC members rarely cheat on their oil production quotas.
   d. OPEC can raise and lower the world price of oil by decreasing and increasing its total production of oil.
   e. Production quotas for OPEC members are well-kept secrets.
Fill in the Blanks

1. A relatively even distribution of market power exists in ________________, while an uneven distribution of market power exists in ________________.

2. The three types of merger activity that are observed include ________________, ________________, and ________________.

3. Price and output decisions by oligopolists tend to be ________________, and ________________ theory is often used to describe their behavior.

4. Oligopoly firms often attempt to increase market share through ________________.

5. In the kinked demand curve model, if the firm raises its price, rivals will ________________, while if it lowers its price, rivals will ________________.

Discussion Questions

1. How does the term *market power* relate to the concentration ratio in a particular industry?

2. Contrast the four-firm concentration ratio and the Herfindahl-Hirschman index as measures of the degree of concentration in an industry.

3. Which types of mergers are most likely to lead to higher concentration ratios? Why?

4. Explain why airlines price discriminate. For example, why would an airline lower price for special weekend getaways or for senior citizens? Does charging different prices to coach and first-class passengers represent price discrimination? Why or why not?
Problems

1. a. Suppose the digital camera industry consists of two firms, Blinkon and Cannon, and that their pricing behavior can be represented by the kinked demand curve model. The following table shows price and quantity combinations for Blinkon under the assumptions that Cannon does and does not follow its pricing behavior. Complete the table to show Blinkon’s total revenue and marginal revenue, and then graph the demand and marginal revenue functions for Blinkon.

<table>
<thead>
<tr>
<th>Price ($/camera)</th>
<th>Quantity Demanded</th>
<th>Total Revenue</th>
<th>Marginal Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>50</td>
<td>200</td>
<td>50</td>
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<tr>
<td>200</td>
<td>100</td>
<td>175</td>
<td>100</td>
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<td>150</td>
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<td>50</td>
<td>250</td>
<td>100</td>
<td>250</td>
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</tbody>
</table>

Demand When Cannon Does Follow Blinkon

<table>
<thead>
<tr>
<th>Price ($/camera)</th>
<th>Quantity Demanded</th>
<th>Total Revenue</th>
<th>Marginal Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>50</td>
<td>200</td>
<td>50</td>
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<td>200</td>
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<td>50</td>
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Demand When Cannon Does Not Follow Blinkon

<table>
<thead>
<tr>
<th>Price ($/camera)</th>
<th>Quantity Demanded</th>
<th>Total Revenue</th>
<th>Marginal Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>50</td>
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<td>50</td>
<td>250</td>
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<td>250</td>
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</tbody>
</table>
b. Identify the equilibrium price and output level. Explain your choice. That is, why aren’t other price and output combinations profit maximizing for Blinkon?

c. By how much could the marginal cost shift without causing the profit-maximizing price to change? Explain.

2. The following table provides hypothetical sales data for 10 firms that comprise the television industry. Ignoring the fact that these companies are from different countries, calculate the four-firm concentration ratio and the Herfindahl-Hirschman index from these data. Show your work. Does this industry seem to be very concentrated at the international level? Explain.

<table>
<thead>
<tr>
<th>Brand</th>
<th>Sales (millions of $s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zenith</td>
<td>25</td>
</tr>
<tr>
<td>Magnavox</td>
<td>15</td>
</tr>
<tr>
<td>Sony</td>
<td>38</td>
</tr>
<tr>
<td>Mitsubishi</td>
<td>22</td>
</tr>
<tr>
<td>Philips</td>
<td>12</td>
</tr>
<tr>
<td>RCA</td>
<td>15</td>
</tr>
<tr>
<td>Panasonic</td>
<td>24</td>
</tr>
<tr>
<td>Samsung</td>
<td>28</td>
</tr>
<tr>
<td>Hitachi</td>
<td>10</td>
</tr>
<tr>
<td>Motorola</td>
<td>8</td>
</tr>
</tbody>
</table>

3. Suppose you are the chief executive officer for the major U.S. brewing company, Riceweiser. At the annual Brewers Association Meetings held in Milwaukee, you and your fellow CEOs from other brewing companies decide (secretly, of course) to collude on price and to allocate shares of the market between firms. Suppose that the price is set at $30 per barrel of beer and your share of the market is set at 2 million barrels per year. The demand, marginal revenue, average total cost, and marginal cost curves for Riceweiser are shown in the graph on the following page.
a. Will Riceweiser make a profit under the cartel agreement? If so, how much profit? Identify the area of profit on the graph?

b. Does Riceweiser have an incentive to cheat on the agreement? Why or why not? Use the graph to justify your answer.

4. Suppose that Riceweiser is the dominant firm in the brewing industry. What will Riceweiser’s output level be as the godfather?

Everyday Applications

The first paragraphs of this chapter in your textbook describe the breakfast cereal aisle in any supermarket. There are many brands, but how many firms are actually producing all these brands? What phenomenon are you observing firsthand? Check the soft drink aisle. Observe the prices on two-liter bottles of various brands of soft drinks. Not much difference, is there? What model of price and output determination under oligopoly could you use to explain the observed stability in soft drink prices?
OPEC, the Organization of Petroleum Exporting Countries, has a Web page (http://www.opec.org/). How does the image OPEC presents in its home page compare to the behavior predicted by the theory of cartels presented in this chapter? Does cartel instability seem to be a problem for OPEC based on the information presented at this Web site?

Answers to Questions

Key Terms Quiz

a. 9  f. 1  k. 18  p. 12  
b. 3  g. 17  l. 4  q. 8  
c. 10  h. 13  m. 6  r. 15  
d. 19  i. 2  n. 5  s. 11  
e. 16  j. 14  o. 7

True-False Questions

1. True
2. True
3. False. A joint venture involves firms that undertake a specific economic activity together. A cartel involves firms that collude to accept agreed-upon price levels and market shares.
4. True
5. True
6. False. The HHI is the sum of the squares of the percentage market shares of all firms in the industry.
7. True
8. True
9. False. The extent of oligopoly power in other industrialized countries is similar to that observed in the United States.
10. True
11. True
12. False. The godfather determines a price that other, smaller firms tacitly accept.
13. False. Conglomerate mergers are the most common form in the United States.
14. True
15. True

Multiple-Choice Questions

2. a  7. c  12. a  17. c  22. e
3. a  8. a  13. d  18. a  23. c
5. b  10. d  15. a  20. c

Fill in the Blanks

1. balanced oligopoly; unbalanced oligopoly
2. vertical mergers; horizontal mergers; conglomerate mergers
3. interdependent; game
Discussion Questions

1. Market power is the ability of a firm to control the price and output in an industry. As the four-firm concentration ratio increases, the leading four firms in an industry control a larger percentage of total industry sales. For this reason, a strong correlation exists between greater market power and higher four-firm concentration ratios.

2. Both the four-firm concentration ratio and the HHI can be used to measure the degree of concentration in an industry. The four-firm concentration ratio gives the ratio of total sales of the four leading firms in an industry to total industry sales. The HHI is calculated by summing the squares of the percentage market shares for all the firms in the industry. By squaring the market shares, the HHI gives greater weight to firms with relatively higher market shares. The HHI has the advantage of highlighting the role that a dominant firm might play in an oligopoly industry. The dominant firm’s position could be obscured by the four-firm concentration ratio. For example, if the dominant firm has 40 percent of the market, and there are many other small firms, the four-firm concentration ratio might only be 50 percent. Using the HHI, however, the dominant firm will contribute 1,600, a relatively large sum, to the index value.

3. Horizontal mergers lead to an immediate increase in an oligopoly’s concentration ratio by decreasing the number of firms. Vertical mergers, too, can lead to an increase in concentration by giving the merged firm a cost or marketing advantage over its competition. A supplier-purchaser relationship is subsumed by a vertical merger that may allow the merged firm to gain access to resources at lower cost than can other firms. Conglomerate mergers have little effect on concentration ratios because the firms merging are from unrelated industries.

4. An airline will attempt to sell as many seats as possible at the upper end of the demand curve at higher prices. But the airline knows that every empty seat represents potential revenue that has been lost. The marginal cost of filling that empty seat is close to zero. After all, the plane flies whether it is full or not. If the airline can devise a way of selling tickets for these otherwise empty seats at lower prices without affecting the sales of other seats, it adds to revenue. That’s why there are senior citizen discounts and special weekend getaway rates for Saturday night stayovers.

Even though coach and first-class passengers are charged different prices for the same flight, the product isn’t the same, so this practice does not represent price discrimination. Circumstances for travelers in first class are vastly superior to what most of us experience in coach. The seats are bigger, the food is better, and the lavatory is available without a long wait, to name just a few of the differences.

Problems

1. a. The completed table and graph, showing the kinked demand curve and the marginal revenue curves for Blinkon are presented below.

<table>
<thead>
<tr>
<th>Price ($/camera)</th>
<th>Quantity Demanded</th>
<th>Total Revenue</th>
<th>Marginal Revenue</th>
<th>Price ($/camera)</th>
<th>Quantity Demanded</th>
<th>Total Revenue</th>
<th>Marginal Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>50</td>
<td>12,500</td>
<td></td>
<td>200</td>
<td>50</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>100</td>
<td>20,000</td>
<td>150</td>
<td>150</td>
<td>50</td>
<td>17,500</td>
<td>150</td>
</tr>
<tr>
<td>150</td>
<td>150</td>
<td>22,500</td>
<td></td>
<td>22,500</td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>200</td>
<td>20,000</td>
<td></td>
<td>25,000</td>
<td></td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>250</td>
<td>12,500</td>
<td></td>
<td>25,000</td>
<td></td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
b. The demand curve is kinked at the price of $150 and sales of 150 cameras. The price will be rigid at $150 because an increase in price would not be followed by Cannon. Therefore, Blinkon would lose sales along the elastic portion of the demand curve above the $150 price level. A decrease in price from $150 puts Blinkon on the more inelastic demand curve, causing a decrease in total revenue from $22,500 to $20,000.

c. Marginal cost could shift anywhere in the gap between the marginal revenue curves at an output level of 150. The gap is $50 — so marginal cost could fluctuate by as much as $50 with no change in the profit-maximizing price.

2. Computing the four-firm concentration ratio — the top four firms are Sony, Samsung, Zenith, and Panasonic. The total of their sales is equal to $115 million. Total sales in the industry are $197 million. The four-firm ratio is 115/197 = .58, or 58 percent.

To compute the HHI, we need the market shares expressed as a percent, then squared and summed. The table on the following page shows these calculations.
<table>
<thead>
<tr>
<th>Brand</th>
<th>Sales (millions of $)</th>
<th>Market Share as % (S)</th>
<th>Market Share Squared (S^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zenith</td>
<td>25</td>
<td>12.6</td>
<td>158.8</td>
</tr>
<tr>
<td>Magnavox</td>
<td>15</td>
<td>7.6</td>
<td>57.8</td>
</tr>
<tr>
<td>Sony</td>
<td>38</td>
<td>19.4</td>
<td>376.4</td>
</tr>
<tr>
<td>Mitsubishi</td>
<td>22</td>
<td>11.1</td>
<td>123.2</td>
</tr>
<tr>
<td>Philips</td>
<td>12</td>
<td>6.2</td>
<td>38.4</td>
</tr>
<tr>
<td>RCA</td>
<td>15</td>
<td>7.6</td>
<td>57.7</td>
</tr>
<tr>
<td>Panasonic</td>
<td>24</td>
<td>12.2</td>
<td>148.8</td>
</tr>
<tr>
<td>Samsung</td>
<td>28</td>
<td>14.2</td>
<td>201.6</td>
</tr>
<tr>
<td>Hitachi</td>
<td>10</td>
<td>5.1</td>
<td>26.0</td>
</tr>
<tr>
<td>Motorola</td>
<td>8</td>
<td>4.0</td>
<td>16</td>
</tr>
<tr>
<td>Sum</td>
<td>197</td>
<td>100</td>
<td>1,204.7</td>
</tr>
</tbody>
</table>

On a national level this industry would be very concentrated. For example, suppose we consider Zenith, Magnavox, RCA, and Motorola to be U.S. companies. The four-firm concentration ratio for U.S. firms is 100 percent! The HHI for these four firms is 2,921. However, on an international level, the apparent market power wielded by U.S. firms is diffused by the existence of large firms from other countries.

3. a. Ricewiser will make a profit under the cartel agreement. The area of profit given the cartel is shown in the graph below by the heavy-lined rectangle. The profit is ($30 - $10) \times 2 \text{ million barrels} = $40 \text{ million}.
b. Riceweiser has incentive to cheat because the profit maximizing level of output is 4 million barrels — MR=MC at 4 million barrels. Riceweiser’s profits could be ($30 - $12) x 4 million barrels = $72 million. The profit is shown below as the area inside the heavy-lined rectangle.

4. Riceweiser will act like a monopolist in this situation. The second graph from problem 3 illustrates the profit-maximizing output, price, and profit. Whatever share of the market is left can be soaked up by the other firms at the price that Riceweiser mandates.
Homework Questions

True-False Questions — If a statement is false, explain why.

1. Vertical mergers increase concentration by more than horizontal mergers. (T/F)

2. The Nash equilibrium solution to a prisoners’ dilemma game is for both players to receive the highest joint payoff. (T/F)

3. The kinked demand curve predicts that when a firm raises price, it will incur a large loss in sales along the more elastic portion of the demand curve. (T/F)

4. In order to price discriminate, a firm must be able to charge different prices to different consumers for exactly the same good or service. (T/F)

5. In order for a cartel to maintain the monopoly price, it must prevent its members from lowering price and/or increasing output. (T/F)

Multiple-Choice Questions

1. If an oligopoly industry is balanced, then
   a. the leading firms in the industry have approximately the same market shares
   b. one firm controls substantially more of the market than the others
   c. the industry is in equilibrium
   d. the concentration ratio is very low
   e. the concentration ratio is diminishing

2. Consider two firms that can be represented by the kinked demand curve model. If the marginal cost increases but stays within the gap between the marginal revenue curves, we would expect that
   a. neither firm will change its price
   b. each firm will raise its price
   c. profits for both firms will increase
   d. the two firms should form a cartel
   e. each firm will realize economies of scale

3. One advantage to the Herfindahl-Hirschman index as a measure of market power compared to the four-firm concentration ratio is that
   a. the index allows for greater concentration than does the four-firm concentration ratio
   b. the index gives greater weight to the leading firms in the industry than does the four-firm concentration ratio
   c. the index is more complicated to calculate, so it is more accurate
   d. by squaring the percentages of market sales, greater weight is given to firms with smaller market shares
   e. the economy appears to be more competitive based on results of Herfindahl-Hirschman index calculations
4. A cartel member may be tempted to cheat on market share if
   a. its quota is greater than the output where MR = MC
   b. it’s quota is less than the output where MR = MC
   c. it can sell more at a higher price
   d. it can sell more at a lower price
   e. the cartel has a strict enforcement policy

5. In the Godfather (or price leadership) model, smaller firms are unlikely to adopt a price-cutting strategy because the Godfather
   a. firm’s product is higher quality
   b. enjoys economies of scale and could undercut the smaller firms’ price
   c. enjoys greater brand loyalty
   d. would simply reduce output in order to keep the market price high
   e. could simply acquire the weaker firms

Discussion Questions/ Problems

1. The payoff matrix shown below represents Ford and General Motors decisions regarding pricing for the new model year. Both firms can either charge a high price or a low price with the payoffs representing profits shown in the matrix.

<table>
<thead>
<tr>
<th>GM charges a high price</th>
<th>GM charges a low price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ford charges a high price</td>
<td>GM profits = 100 million  Ford profits = 100 million</td>
</tr>
<tr>
<td>Ford charges a low price</td>
<td>GM profits = 20 million  Ford profits = 200 million</td>
</tr>
<tr>
<td>Ford charges a high price</td>
<td>GM profits = 20 million  Ford profits = 200 million</td>
</tr>
<tr>
<td>Ford charges a low price</td>
<td>GM profits = 30 million  Ford profits = 30 million</td>
</tr>
</tbody>
</table>

   a. Is there a Nash equilibrium strategy in this matrix? Explain.

   b. Suppose that both firms start by charging a high price, then adopt a tit-for-tat price-cutting strategy. What will be the outcome? Explain the outcome in the context of prisoners’ dilemma.

2. Consider cartel pricing, the price leadership model, and the kinked demand curve model. Which of these three models predicts price stability in oligopoly and which predict price instability, that is, unpredictable ups and downs in the level of prices in the industry. Explain.